

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims

1. (Currently Amended) A method, comprising:
processing a request to write to a source file in a storage system;
determining whether a retention rule is provided for the source file in response to the write request;
in response to determining that one retention rule is provided for the source file, generating a versioned file name, wherein a versioned file comprises the source file at a point-in-time;
transmitting a command to a file system to copy the source file data to a versioned file having the generated versioned file name;
adding the generated versioned file name to a retention index file indicating versioned files for the source file; [[and]]
determining from the retention index versioned files for the source file to purge in response to determining that the retention rule indicates a maximum number of versioned files for the source file and the versioned files for the source file do not satisfy the retention rule;
determining from the retention index versioned files for the source file to purge in response to determining that the retention rule indicates a time limit of versioned files for the source file and the versioned files for the source file do not satisfy the retention rule; and
~~processing the retention index file to determine whether to purge versioned files according to the retention rule provided for the source file~~
issuing a command to purge the determined versioned files.
2. (Currently Amended) The method of claim 1, further comprising: wherein
~~purging the versioned files comprises:~~
~~determining versioned files to purge according to the retention rule;~~
deleting the ~~determined~~ versioned file names for the determined versioned files to purge from the retention index file, wherein the command to purge is issued by; and transmitting [[a]]

the command to the file system to delete versioned files having the determined versioned file names.

3. (Original) The method of claim 1, further comprising:
applying a function to the source file name to determine the retention index file, wherein the determined retention index file maintains names of versioned files for the source file to which the function is applied, and wherein the generated versioned file name is added to the determined retention index.

4. (Original) The method of claim 3, wherein the function comprises a hash function, and wherein one retention index may maintain versioned file names for multiple source files to which the function is applied.

5. (Currently Amended) The method of claim 1, wherein determining processing from the retention index file the versioned files to determine whether to purge versioned files according to the retention rule further comprises:

sorting the versioned file names for the source file in the retention index file ordered on a timestamp included in the versioned file names; and

selecting versioned files from the sorted versioned file names to purge.

6. (Currently Amended) The method of claim 5, wherein ~~the retention rule specifies a maximum number of versioned files to have for the source file, and wherein selecting versioned files to purge~~ determining from the retention index versioned files for the source file to purge in response to determining that the retention rule indicates a maximum number of versioned files for the source file comprises:

determining whether a number of the sorted versioned file names exceeds the maximum number; and

selecting a number of oldest sorted versioned file names to purge to reduce the number of versioned file names in the retention index file to reach the maximum number.

7. (Currently Amended) The method of claim 5, wherein ~~the retention rule specifies a time limit on versioned files to maintain for the source file, and wherein selecting versioned files to purge~~ determining from the retention index versioned files for the source file to purge in response to determining that the retention rule indicates the time limit of versioned files for the source file and the versioned files for the source file do not satisfy the retention rule comprises:

determining whether sorted version file names exceed the time limit according to the timestamp for the sorted versioned file names; and

selecting versioned file names in the retention index whose timestamp exceeds the time limit to purge versioned files whose timestamp exceeds the time limit.

8. (Currently Amended) The method of claim [[5]] 1, further comprising: determining from the retention index versioned files for the source file to purge in response to determining that the retention rule ~~wherein the retention rule specifies a time period and maximum number of versioned files to maintain for the source file within the specified time period and the versioned files for the source file do not satisfy the retention rule, and wherein selecting versioned files to purge~~ comprises:

~~determining whether a number of the sorted versioned file names within the specified time period exceeds the specified maximum number; and~~

~~selecting a number of oldest sorted versioned file names to purge to reduce the number of versioned file names in the retention index file in the specified time period to reach the maximum number.~~

9. (Original) The method of claim 8, wherein the retention rule specifies multiple time periods and one maximum number for each time period to separately maintain versioned files for the source file for different time periods, wherein the determining whether the number of versioned files to maintain for the source file exceeds the specified maximum number is performed for each specified time period, and wherein selecting the number of oldest versioned file names to purge to reduce the number of versioned file names in the retention index file is performed for each specified time period to reach the maximum number specified for the time period.

10. (Currently Amended) The method of claim 1, wherein the operations of processing the request, determining whether one retention rule is provided, generating a new versioned file name, transmitting the command, adding the generated versioned file name to the retention index file, determining from the retention index the versioned files for the source file to purge, and issuing the command to purge and ~~processing the retention index file~~ are performed by a host system and wherein the versioned file, source file, and file system are on a remote storage system.

11. (Currently Amended) The method of claim 10, wherein retention index files are maintained at local storage to the host system and accessed locally by the host system to determine versioned files to purge according to retention rules.

12. (Original) The method of claim 1, wherein the processing of the write request and the retention rules are performed by a program executing in a kernel of an operating system.

13. (Original) The method of claim 1, wherein the retention rule identifies a name of one source file to which the rule applies or identifies a source that created the source file to which the rule applies.

14. (Currently Amended) A system, comprising:
a first storage system including source files;
a second storage system including retention rules for the source files;
a file system;
a file retention filter enabled to cause operations to be performed, the operations comprising:

~~means for~~ processing a request to write to one of the source files in the first storage system;

~~means for~~ determining whether one of the retention rules is provided for the source file in response to the write request;

~~means for~~ generating a versioned file name in response to determining that one retention rule is provided for the source file, wherein a versioned file comprises the source file at a point-in-time;

transmitting a command to the file system to copy the source file data to a versioned file having the generated versioned file name in the first storage system;

~~means for~~ adding the generated versioned file name to a retention index file in the second storage system indicating versioned files for the source file; [[and]]

~~means for processing the retention index file to determine whether to purge versioned files according to the retention rule provided for the source file~~

determining from the retention index versioned files for the source file to purge in response to determining that the retention rule indicates a maximum number of versioned files for the source file and the versioned files for the source file do not satisfy the retention rule;

determining from the retention index versioned files for the source file to purge in response to determining that the retention rule indicates a time limit of versioned files for the source file and the versioned files for the source file do not satisfy the retention rule;
and

issuing a command to purge the determined versioned files.

15. (Currently Amended) The system of claim 14, wherein the operations further comprise ~~further comprising means for purging the versioned files by:~~

~~determining versioned files to purge according to the retention rule;~~

deleting the ~~determined~~ versioned file names for the determined versioned files to purge from the retention index file, wherein the issuing the command to purge comprises and ~~transmitting a~~ transmitting the command to the file system to delete versioned files having the determined versioned file names.

16. (Currently Amended) The system of claim 14, wherein the operations further comprising ~~comprise:~~

~~means for~~ applying a function to the source file name to determine the retention index file, wherein the determined retention index file maintains names of versioned files for the

source file to which the function is applied, and wherein the generated versioned file name is added to the determined retention index.

17. (Currently Amended) The system of claim 14, wherein the ~~means for determining from processing the retention index file the versioned files to determine whether to purge versioned files according to the retention rule performs~~ comprises:

sorting the versioned file names for the source file in the retention index file ordered on a timestamp included in the versioned file names; and

selecting versioned files from the sorted versioned file names to purge.

18. (Currently Amended) The system of claim 14, wherein the operations of ~~means for~~ processing the request, determining whether one retention rule is provided, generating a new versioned file name, transmitting the command, adding the generated versioned file name to the retention index file, determining from the retention index the versioned files for the source file to purge, and issuing the command to purge ~~and processing the retention index file~~ are performed by a host system, wherein the host communicates with the first storage system over a network and wherein the second storage system is local storage to the host.

19. (Currently Amended) The system of claim 14, wherein the ~~means for~~ operations of processing of the write request and the retention rules are performed by a program executing in a kernel of an operating system.

20. (Currently Amended) A system in communication a remote storage system having source files and a remote file system managing access to the remote storage system, comprising:
a local storage system including retention rules for the source files;
a file retention filter enabled to cause operations to be performed, the operations comprising:

~~means for~~ processing a request to write to one of the source files in the remote storage system;

~~means for~~ determining whether one of the retention rules is provided for the source file in response to the write request;

~~means for~~ generating a versioned file name in response to determining that one retention rule is provided for the source file, wherein a versioned file comprises the source file at a point-in-time;

transmitting a command to the remote file system to copy the source file data to a versioned file having the generated versioned file name in the remote storage system;

~~means for~~ adding the generated versioned file name to a retention index file in the local storage system indicating versioned files for the source file; [[and]]

~~means for processing the retention index file to determine whether to purge versioned files according to the retention rule provided for the source file~~

determining from the retention index versioned files for the source file to purge in response to determining that the retention rule indicates a maximum number of versioned files for the source file and the versioned files for the source file do not satisfy the retention rule;

determining from the retention index versioned files for the source file to purge in response to determining that the retention rule indicates a time limit of versioned files for the source file and the versioned files for the source file do not satisfy the retention rule;
and

issuing a command to purge the determined versioned files.

21. (Currently Amended) The system of claim 20, ~~further comprising means for purging the versioned files by~~ wherein the operations further comprise:

~~determining versioned files to purge according to the retention rule;~~

deleting the ~~determined~~ versioned file names for the determined versioned files to purge from the retention index file; and, wherein the command to purge is issued by transmitting [[a]] the command to the file system to delete versioned files having the determined versioned file names.

22. (Currently Amended) The system of claim 20, wherein the operations further comprising comprise:

~~means for~~ applying a function to the source file name to determine the retention index file, wherein the determined retention index file maintains names of versioned files for the

source file to which the function is applied, and wherein the generated versioned file name is added to the determined retention index.

23. (Currently Amended) An article of manufacture comprising a computer readable storage medium including code that is executed for processing a request to write to a source file in a storage system that is in communication with a file system, wherein the code is executed to cause operations to be performed, the operations comprising:

processing a write request to the source file;

determining whether a retention rule is provided for the source file in response to the write request;

in response to determining that one retention rule is provided for the source file, generating a versioned file name, wherein a versioned file comprises the source file at a point-in-time;

transmitting a command to a file system to copy the source file data to a versioned file having the generated versioned file name;

adding the generated versioned file name to a retention index file indicating versioned files for the source file; [[and]]

~~processing the retention index file to determine whether to purge versioned files according to the retention rule provided for the source file~~

determining from the retention index versioned files for the source file to purge in response to determining that the retention rule indicates a maximum number of versioned files for the source file and the versioned files for the source file do not satisfy the retention rule;

determining from the retention index versioned files for the source file to purge in response to determining that the retention rule indicates a time limit of versioned files for the source file and the versioned files for the source file do not satisfy the retention rule; and

issuing a command to purge the determined versioned files.

24. (Currently Amended) The article of manufacture of claim 23, further comprising: ~~wherein purging the versioned files comprises:~~

~~determining versioned files to purge according to the retention rule;~~

deleting the ~~determined~~ versioned file names for the determined versioned files to purge from the retention index file, wherein the command to purge is issued by; ~~and~~ transmitting [[a]] the command to the file system to delete versioned files having the determined versioned file names.

25. (Original) The article of manufacture of claim 23, wherein the operations further comprise:

applying a function to the source file name to determine the retention index file, wherein the determined retention index file maintains names of versioned files for the source file to which the function is applied, and wherein the generated versioned file name is added to the determined retention index.

26. (Original) The article of manufacture of claim 25, wherein the function comprises a hash function, and wherein one retention index may maintain versioned file names for multiple source files to which the function is applied.

27. (Currently Amended) The article of manufacture of claim 23, wherein determining from processing the retention index file the versioned files to determine whether to ~~purge versioned files according to the retention rule~~ further comprises:

sorting the versioned file names for the source file in the retention index file ordered on a timestamp included in the versioned file names; and

selecting versioned files from the sorted versioned file names to purge.

28. (Currently Amended) The article of manufacture of claim 27, wherein ~~the retention rule specifies a maximum number of versioned files to have for the source file, and wherein selecting versioned files to purge~~ determining from the retention index versioned files for the source file to purge in response to determining that the retention rule indicates a maximum number of versioned files for the source file comprises:

determining whether a number of the sorted versioned file names exceeds the maximum number; and

selecting a number of oldest sorted versioned file names to purge to reduce the number of versioned file names in the retention index file to reach the maximum number.

29. (Currently Amended) The article of manufacture of claim 27, wherein ~~the retention rule specifies a time limit on versioned files to maintain for the source file, and wherein selecting versioned files to purge~~ determining from the retention index versioned files for the source file to purge in response to determining that the retention rule indicates the time limit of versioned files for the source file and the versioned files for the source file do not satisfy the retention rule comprises:

determining whether sorted version file names exceed the time limit according to the timestamp for the sorted versioned file names; and

selecting versioned file names in the retention index whose timestamp exceeds the time limit to purge versioned files whose timestamp exceeds the time limit.

30. (Currently Amended) The article of manufacture of claim ~~[[27]]~~ 23, further comprising:

determining from the retention index versioned files for the source file to purge in response to determining that the retention rule ~~wherein the retention rule specifies a time period and maximum number of versioned files to maintain for the source file within the specified time period and the versioned files for the source file do not satisfy the retention rule, and wherein selecting versioned files to purge comprises:~~

~~determining whether a number of the sorted versioned file names within the specified time period exceeds the specified maximum number; and~~

~~selecting a number of oldest sorted versioned file names to purge to reduce the number of versioned file names in the retention index file in the specified time period to reach the maximum number.~~

31. (Original) The article of manufacture of claim 30, wherein the retention rule specifies multiple time periods and one maximum number for each time period to separately maintain versioned files for the source file for different time periods, wherein the determining whether the number of versioned files to maintain for the source file exceeds the specified

maximum number is performed for each specified time period, and wherein selecting the number of oldest versioned file names to purge to reduce the number of versioned file names in the retention index file is performed for each specified time period to reach the maximum number specified for the time period.

32. (Currently Amended) The article of manufacture of claim 23, wherein the operations of processing the request, determining whether one retention rule is provided, generating a new versioned file name, transmitting the command, adding the generated versioned file name to the retention index file, determining from the retention index the versioned files for the source file to purge, and issuing the command to purge ~~and processing the retention index file~~ are performed by a program in host system and wherein the versioned file, source file, and file system are on a remote storage system.

33. (Original) The article of manufacture of claim 32, wherein retention index files are maintained at local storage to the host system and accessed locally by the host system to determine versioned files to purge according to retention rules.

34. (Original) The article of manufacture of claim 23, wherein the processing of the write request and the retention rules are performed by a program executing in a kernel of an operating system.

35. (Original) The article of manufacture of claim 23, wherein the retention rule identifies a name of one source file to which the rule applies or identifies a source that created the source file to which the rule applies.